THE BAYLOR BULLETIN

Baylor Business Studies

NINETEENTH ISSUE

INDEX OF WACO BUSINESS ACTIVITY 1941-1954

By

EDWIN F. MOORE, PH.D.
Director, Division of Research

Founded 1845 at Independence
Under the Republic of Texas

THE SCHOOL OF BUSINESS
BAYLOR UNIVERSITY
WACO, TEXAS

Price 50 Cents

JUNE, 1954

Baylor Business Studies

Published Quarterly by the
Committee on Research, School of Business
Baylor University, Waco, Texas

Subscription Price $1.50 Per Year

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VOLUME LVII JUNE, 1954 NUMBER 11

Published quarterly by Baylor University, and entered at the Post Office at Waco, Texas, as Second Class Mail Matter.

ACKNOWLEDGMENT

The writer wishes to acknowledge his gratitude to Mr. S. C. O'Neal of the Waco Chamber of Commerce and to Mr. Chris Whitcraft of the Waco Tribune-Herald for their assistance in contacting primary sources of data, to the Building Department of the City of Waco for providing data on building permits, to the Texas Power and Light Company for providing industrial power consumption figures, to the Assistant Postmaster's Office for providing postal receipts figures, to the five banks of Waco and vicinity for bank debit amounts, to the Bureau of Business Research of the University of Texas for providing data on changes in retail sales, to the Waco office of the Texas Employment Commission for data on employment in retail trade, and to a number of advanced students of statistics at Baylor University who have contributed much work in the computations necessary in constructing an index of this nature. Among these students were James E. Byus, Brian A. Dawson, Norimasa Hiraoka, Jack S. Miller, William P. Patterson, and Charles H. Purdy. Mr. Purdy, in his research during the writing of his master's thesis, assisted in setting up certain of the procedures of collecting and analyzing the data. Mr. Miller and Mr. Patterson are currently engaged in computation necessary each month for the continuation of the index. The writer is grateful for the patience and thoroughness exhibited by these students in many hours of computations and checking.

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TABLE OF CONTENTS

Acknowledgment 3

I. Introduction 7

A. Purpose 7
B. Limitations 7
C. Time Period Considered 8

II. Construction of the Index 8

A. Factors Included 8
Building Permits 8
Postal Receipts 9
Industrial Power Consumption 12
Bank Debits 12
Retail Sales 13
Freight Car Loadings 14
B. Combining the Factors 14

III. Conclusions 16

FIGURE

Baylor University Index of Waco Business Activity 1941-1954 10-11

I. INTRODUCTION

In present day America there is a great deal of interest on the part of most businessmen and a sizeable portion of the general public in fluctuations that occur in the level of general business activities. Particularly concerned with such changes taking place in the level of business activities are those who have the responsibilities of participating in the management of corporations and those who own and operate their own businesses. Information about the nation's business and, more particularly, about the business of one's own locality is very helpful in making profitable decisions concerning increases or decreases in inventory, payroll, advertising and prices, and concerning many other matters of business policy.

A. Purpose

The purpose of this paper is to present a composite index of the level of general business activity for this immediate area. In this paper will be summarized briefly the factors which have been used in the construction of the index and some indications of the techniques used in its construction.

In addition to furnishing a service to the businessmen of this area, it is the purpose of this project to furnish practical laboratory training to advanced students of statistics in the School of Business of Baylor University. The students who have worked and are working under direction on the construction of the composite index are profiting by facing and helping to solve many of the problems associated with the gathering and analyzing of business and economic data. It is believed that they will be better prepared to serve in places of responsibility in business because of their experience in this work.

B. Limitations

No one composite index figure could do justice to all of the changes occurring in business activity at any particular time. Some segments of business may actually be in a period of decreasing activity while others are forging their way to new heights. A monthly index figure must, therefore, be considered as reflecting only the over-all picture of the health and vitality of the business community.

One particular limitation to accuracy in this index is the in-

adequate data available on retail sales in this area. This limitation will be discussed later in this paper.

C. Time Period Considered

For the preliminary computations which were necessary for the purpose of determining seasonal factors in the various components of the index, monthly data were collected over a period extending back for more than twenty years. However, it is believed that most interest in the level of general business activity for Waco and vicinity would be centered on the World War II period and the years since that war. Consequently, the composite index has been computed for each month from January, 1941, to the present time.

II. CONSTRUCTION OF THE INDEX

A. Factors Included

In the construction of an index of general business activity for any locality, one of the first problems to be solved is the selection of factors to be included in the computations. Different localities or areas have different types of business activities, and the different types have different weights on the over-all activities of the business community. In selecting the more appropriate factors, the business statistician necessarily has to consider the following three questions: (1) the purpose of the index; (2) location and accessibility of the desired data; (3) the tenets of accepted statistical procedures.

In order that a composite index of general business activity may be accurate, it should include directly as many of the important types of business activity in this locality as are practical and some factors of a general nature which would indirectly include as many as possible of the factors not directly included. The necessity for considering the accessibility of the data should be apparent. The statistician inevitably finds it impossible to include in an index some of the factors which he considers pertinent because the data for these factors are invalid or possibly not even recorded. In such event, the only way to have the effect of such factors included is through their reflection in more general factors. In the following paragraphs are listed the factors which have been used in the construction of the index of general business activity for Waco.

Building Permits. The construction industry is one for which there is available a rather good statistical series showing relative

activity. All construction taking place within the City of Waco must be preceded by the issuance of a building permit by the city; thus there are on file figures from which may be tabulated the number, type, and value of buildings constructed. The common denominator of all building permit records is the estimated cost of construction.

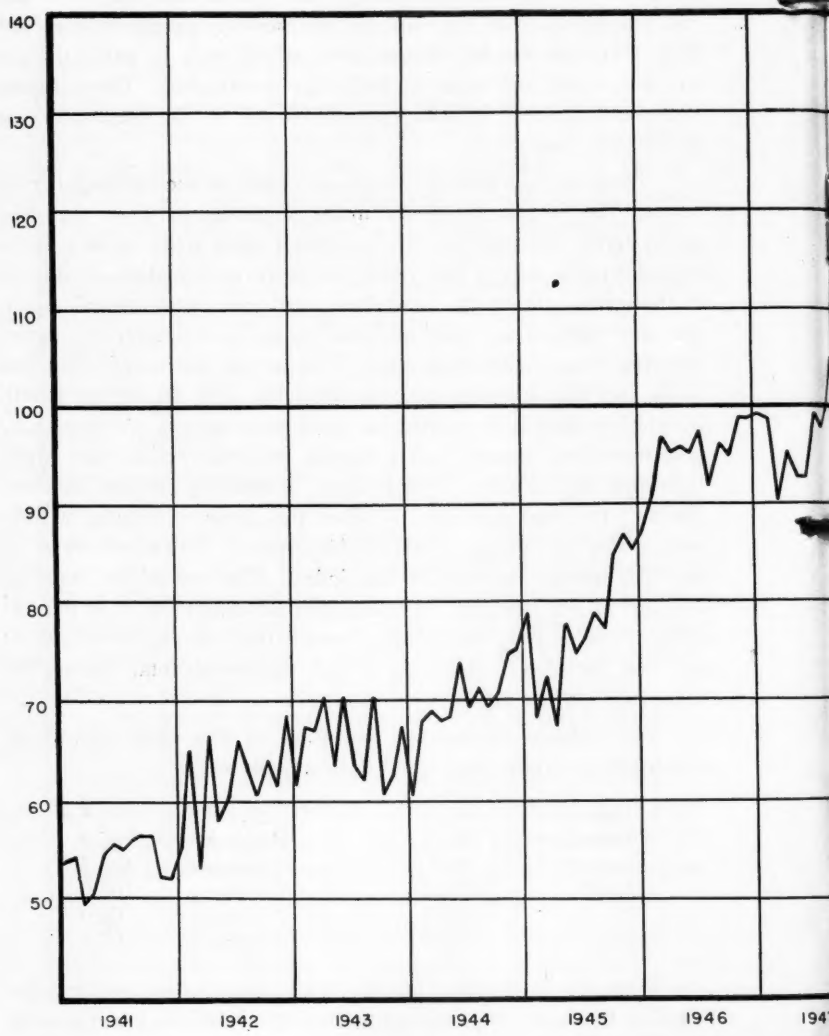
There are two principal sources of error in the building-permit series. The first is that the estimates of production costs are often understated. Fortunately, this understatement tends to be a fairly constant percentage of true costs; therefore, examination of changes in the series—the upward and downward variations—reveals about the same pattern as would be found by an examination of a series showing true construction costs. The second source of error lies in the fact that buildings are not completely built during the month in which a permit is granted for their construction. A home may take from three months to six months for construction, and larger buildings may require a year or more of building activity for completion. In order partially to offset this error of timing, a five-month moving average of the building-permit series—centered on the fifth month—is used in this index. The use of this moving average means that the representation of construction activity is affected not only by the building permit total during the month in question, but also by the value of building permit totals during the preceding four months.

The pattern of seasonal variation of this data concerning construction activity was found to be as follows:

January	96.1	July	94.6
February	97.7	August	102.3
March	98.9	September	103.5
April	103.3	October	108.0
May	102.8	November	99.9
June	95.6	December	97.3

These seasonal index figures were used to deseasonalize the monthly totals of the building-permit series before incorporating them into the composite index of general business activity. Adjustment was also made in these totals for price fluctuations.

Postal Receipts. The series of monthly postal receipts is considered to be a relatively good indirect indicator of many phases of business activity. Accurate figures, of course, are available for this series at the local post office. This is the only series given in



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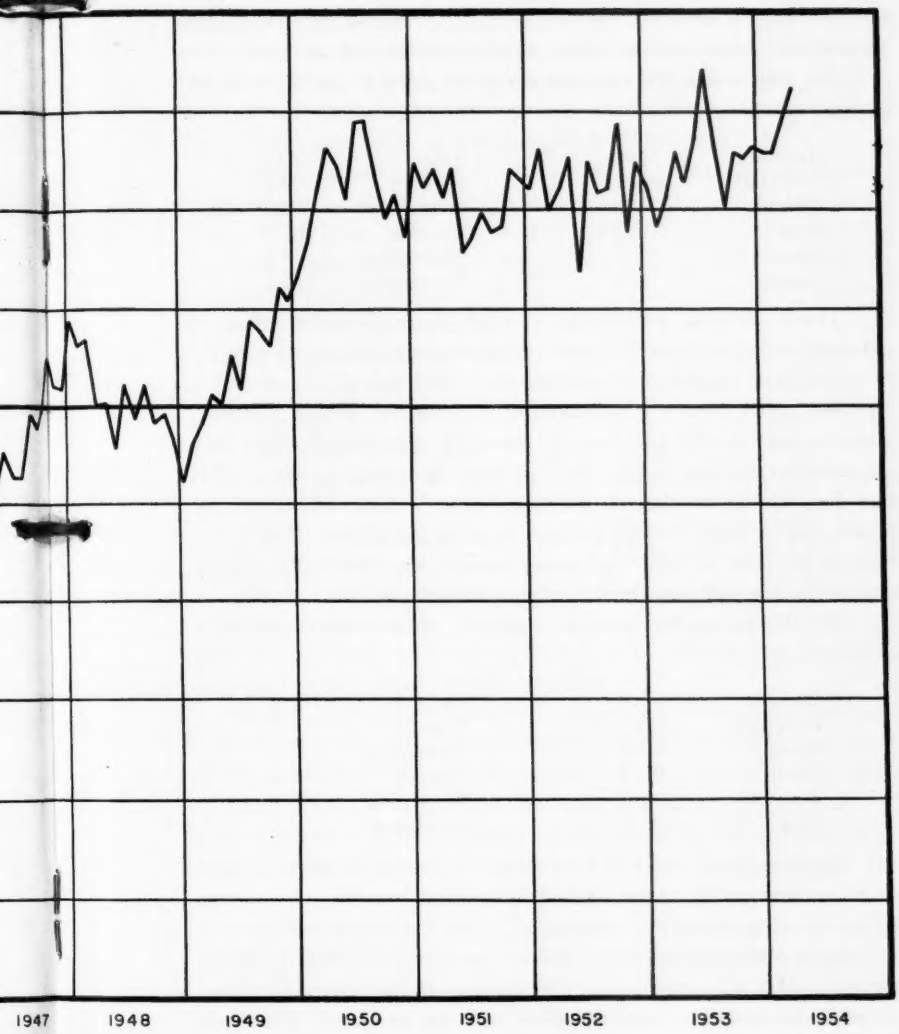

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variation (1947-1949 average = 100)

dollar values which was not adjusted for the purchasing power of the dollar. The reason for this fact is apparent since postal rates do not fluctuate as do the prices of other goods and services.

For this series, the seasonal variation pattern was found to be as follows:

January	99.6	July	93.3
February	92.1	August	93.8
March	98.8	September	94.2
April	102.2	October	107.8
May	97.7	November	94.7
June	94.6	December	131.1

These seasonal indexes were used to remove the effect of seasonal variation from the postal receipts series before the monthly totals were incorporated into the composite index.

Industrial Power Consumption. Industrial power statistics serve a very useful purpose in revealing surprisingly well any appreciable changes in the level of manufacturing activity. This fact does not imply that all manufacturing is done with electrical power, but a large enough portion is so accomplished that variations in the level of industrial power consumption faithfully portray changes in over-all industrial activity volume.

For this series, the seasonal variation pattern was found to be as follows:

January	91.4	July	101.2
February	96.8	August	101.7
March	87.4	September	111.1
April	97.2	October	108.2
May	94.4	November	106.6
June	106.8	December	97.2

These seasonal indexes were used to remove the effect of seasonal variation from the industrial power consumption series before the figures were incorporated in the composite index.

Bank Debits. Changes in the volume of bank debits probably are as good a measurement of the changes in the general level of business as any data available directly from business. The bank debits series is, of course, a tabulation of the amounts withdrawn from checking accounts and is thus a picture of the volume of money transactions. In most cases, money transactions represent payment for goods or services by individuals or by businesses. Therefore, it seems logical to think of changes in the bank debits series as reflecting changes in the general volume of business being

transacted. It is true that there are some duplications or overlaps, as seen in the transfer of a piece of merchandise from a wholesaler to a retailer and on to some ultimate consumer. However, this overlapping in the bank debits does accurately portray the fact that there were actually two separate purchases transacted, even though only one piece of merchandise was involved.

Bank debits are also very useful as an indirect measurement of activity in the service and amusement enterprises. It is apparent that in both these lines some activity may fail to be represented in the bank debits total. However, this portion probably fluctuates at approximately the same rate as that portion of activity carried on by money flowing through the banks.

For this series, the seasonal variation pattern was found to be as follows:

January	102.3	July	92.7
February	92.4	August	94.0
March	104.7	September	103.9
April	96.6	October	108.1
May	93.0	November	102.6
June	98.6	December	111.2

These seasonal indexes were used to remove the effect of seasonal variation from the bank debits series before the figures were incorporated in the composite index. Adjustment was also made in this series for price fluctuations.

Retail Sales. The variations in activity in retailing are very important in any study of the over-all business and economic level of a community. The month-to-month fluctuations in retail trade of Waco and area are at present not very accurately known. A small number of Waco retail firms are reporting the monthly fluctuations in their volume to the Bureau of Business Research of the University of Texas and these figures are used in the construction of a state-wide index of business activity. Through the co-operation of Dr. John R. Stockton of the Texas Bureau of Business Research, the monthly fluctuations in retail sales in Waco, as measured by the previously mentioned sample, have been made available for the purpose of this study. These data have been used as the best available source of information concerning month-to-month changes. Adjustment has been made in year-to-year changes through the use of the number of persons employed in retail trade activities and the amount of newspaper advertising lineage purchased. It is hoped that, in time to come, the Division of Research

of the Baylor School of Business will be able to make a more adequate measurement of Waco retail trade than has heretofore been made. If a number of local merchants become sufficiently interested in a more accurate measurement, then there is no reason why it cannot be accomplished.

For the retail sales series, the seasonal variation pattern was found to be as follows:

January	85.8	July	86.7
February	83.7	August	95.7
March	99.0	September	107.3
April	96.6	October	108.4
May	103.3	November	104.5
June	90.6	December	138.4

These seasonal indexes were used to remove the effect of seasonal variation from the retail sales series before the totals were incorporated in the composite index. Adjustment was also made in this series for price fluctuations.

Freight Car Loadings. As an indicator of activity in transportation, the freight car loadings total for all railroads in Waco has been used. It is not at all a complete indication of transportation activity, but it is the only accurate and readily obtainable series in physical volume form which can be used to indicate activity in this field.

For this series, the seasonal variation pattern was found to be as follows:

January	90.9	July	102.4
February	89.6	August	111.5
March	107.8	September	108.7
April	101.6	October	106.6
May	102.3	November	94.9
June	93.5	December	90.0

These seasonal indexes were used to remove the effect of seasonal variation from the freight car loadings before the figures were incorporated in the composite index.

B. Combining the Factors

The general idea of using together several series of statistical data in order to obtain one series which will picture the general movement is certainly not new. The simple arithmetic processes involved, as well as some of the problems to be solved, can possibly be shown best by a hypothetical example.

Suppose that only two factors—industrial power consumption and retail sales—are to be combined to make an index. Suppose further that retailing is five times as important as the industrial consumption of power. It is apparent that both activities can be measured, but the units are necessarily different—dollars of sales and kilowatt hours of power consumed. It is clearly improper to add 100,000 dollars and 500,000 kilowatt hours to get a composite picture of the economy represented by 600,000 hour-dollars.

Even more improper would be a comparison of this 600,000 hour-dollars with 675,000 hour-dollars resulting from the addition of 105,000 dollars and 570,000 kilowatt-hours. The increase from 600,000 to 675,000 (12.5%) would have no meaning for two reasons. The first is that we are combining non-comparable units of measurement, and the second is that the change in the combined index in no way reflects the relative importance of the two components (retailing and industrial power consumption). While the activity with an importance of five increased 5%, the activity with an importance of only one increased by 14%; and the combined measure erroneously showed the increased activity.

In order to obtain a much more realistic result, the percentage change of each series should be calculated and then the changes should be arithmetically combined as follows:

	Retailing	Industrial Power Consumed
Activity in 1952	100,000	500,000
Activity in 1953	105,000	570,000
1953 as per cent of 1952 (1953's index of activity)	105	114
Importance of factor	5	1
Index times weight	525	114
Sum of weighted indexes	639	
Divided by total weight	6	
Gives the Composite Index	106.5	

These figures show that if the indexes for both series are weighted with a measure of their relative importance and the total is divided by the sum of the weights, a far more logical figure results. In the hypothetical case illustrated, the level of activity would be shown as 12% higher in 1953 than in 1952.

In much the same fashion as illustrated above, the six factors used for our index of business activity are combined in a weighted

fashion to yield the composite figure. The base period from which all individual indexes are calculated is the average of the three-year period, 1947-1949. As the monthly figure for each of the factors becomes available, it is adjusted for seasonal variation and also (in the series where this is necessary) for price fluctuations. This adjusted value is then expressed as an index of the 1947-1949 base period average. The final phase of the process for calculating the index for April of this year would appear as follows:

	Index for April	Weight for the Series	Weighted Index
Building Permits	114.8	10	1,148
Postal Receipts	157.1	15	2,356.5
Industrial Power Consumption	161.0	20	3,220
Bank Debits	135.6	25	3,390
Retail Sales	113.4	20	2,268
Freight Car Loadings	85.5	10	855
TOTAL	-----	100	13,237.5
Composite Index			132.4

III. CONCLUSIONS

As is mentioned earlier in this paper, no composite index can show details of fluctuations in various types of business. The index presented herewith can yield only an estimate of the general level of activity for this community. It is probable that many businessmen will be able to derive some benefit from an index of this nature. If such result is obtained, the Division of Research of the School of Business of Baylor University will feel justified in the expenditure of time and effort which has brought about this index.

It should be expected that an index calculated for a city and its environs will show more month-to-month fluctuations than would be shown by a state-wide index. Variations which occur in the factors used tend more nearly to balance themselves when a wider area is being studied. It should be apparent in looking at the graphical presentation of the index that Waco has not experienced, during the past year, any great amount of recessionary movements in the general business level. The community is much more fortunate in this respect than many other cities.

If sufficient interest is shown following the publication of this study, the Division of Research of the Baylor School of Business plans to release monthly an index value showing the level of business activity in Waco for the preceding month. It is also planned

for much further study to be made of this index with the aim of refining its construction in any way possible. It is currently believed that any error which may be contained in this indicator of business activity is on the conservative side. It may well be that, with more complete data concerning retail sales, the level of business activity in Waco may be found to be a few points higher than here indicated.

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